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Applying Research in Forestry

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Chemical Control of Sugar Maple in the Understory

Control of understory sugar maple cannot be accomplished by cutting alone, whereas herbicides can provide excellent control. Three different herbicide application techniques are discussed.

Sugar maple is becoming abundant in the understory on better quality oak sites. It competes with oak in the understory for light, water and nutrients. Being a shade tolerant species, sugar maple grows faster and eventually suppresses young shade intolerant oak seedlings.

Sugar maple sprouts prolifically after cutting making it impossible to control by this method alone. Cutting followed by herbicide application can control sugar maple, but this method is infrequently used where sugar maple is a problem. In 1984, a research project was initiated to determine the effectiveness of three herbicide application methods to control understory sugar maple. The first study looked at the effectiveness of cut-surface application, a second study tested foliar application, while a third study evaluated basal stem application of herbicides during the dormant season. The studies were conducted at the Ashland Wildlife Area located in southeastern Boone County.

All herbicides were applied at the highest recommended label rate in each of the studies (Table 1). A backpack sprayer was used to apply herbicides in the foliar and basal stem trials. Chemicals were applied with the sprayer from at least two sides of each tree "to wet" but not to "run off". A paint brush applicator was used in the cut-surface study. The experimental design for each study consisted of a randomized complete block with three replications.

In the foliar-mist application study, trees ranging from 0.1 to 4.6 inches diameter breast height (DBH) and averaging 1 inch DBH were treated after full leaf out. All trees were classified according to topkill and mortality. For the dormant season basal stem application study, sugar maple trees with many dead leaves indicating vigorous growth during the previous growing season were treated in late winter prior to leaf out. Trees were sprayed to a height of 24 inches from the ground except for Weedone CB which was sprayed to a height of 36 inches per label recommendation. Defoliation was observed during early fall of 1985, 1986 and 1987. For the cut-surface application study, vigorously growing sugar maples from 2- to 3-inch DBH were treated. All trees were cut in early summer approximately 6 to 8 inches above the ground with a chain saw. The entire cut-surface was painted immediately with the appropriate herbicide or left untreated.

Results

Dormant Season, Basal Stem Application Study One growing season after treatment only two herbicides, Garlon 4 and Weedone CB, provided more than 80% topkill (Table 2). Topkill percentages increased slightly in all treatments from year one to year two, with Tordon 101 M showing the greatest increase (73% to 87%). Data collected 3 years

Table 1. Herbicides and rates in ounces per gallon of application for foliar, basal stem and cut surface applications for sugar maple control.

		Rate (ounces/gallon)		
Trade Name	**Common Name**	**Foliar**	**Stem**	**Cut Surface**
Roundup	Glyphosate	2.7	NT	NT
Banvel 720	Dicamba salt + 2,4-D	12.6	NT	NT
Banvel CST	Dicamba salt	NT	NT	Undiluted
Banvel 520	Dicamba ester + 2,4-D	NT	17.4	NT
Krenite	Fosamine ammonium	2.6	NT	NT
Tordon 101M	Picloram + 2,4-D	25.6	1.0	NT
Tordon RTU	Picloram + 2,4-D	NT	NT	Undiluted
Garlon 3A	Triclopyr salt	4.2	NT	Undiluted
Garlon 4	Triclopyr ester	3.2	1.0	NT
Weedone 2,4-DP	Dichlorprop (2,4-DP ester)	1.3	NT	NT
Weedone CB	2,4-D + 2,4-DP	NT	Undiluted	Undiluted
Weedone 170	2,4-DP + 2,4-D	1.9	NT	4.5
Weedone 64	2,4-D amine	1.0	NT	NT
Weedone LV-4	2,4-D ester	5.3	NT	NT

NT = Not Tested

Table 2. Percentage topkill (1985 and 1986) and whole-plant mortality (1987) of sugar maple following a dormant season, basal stem application of herbicide.

	Topkill		Mortality
Trade Name	1985	1986	1987
Weedone CB[1]	87	89	42b
Garlon 4[2]	82	92	74a
Banvel 520[2]	69	73	40b
Tordon 101M[2]	73	87	67a
Control	0	0	0c

[1]Spray height 36 inches (per label)

2Spray height 24 inches (per label)

[3]Means with common letters are not significantly different at $P<0.05$.

after treatment were recorded as mortality: trees that were without basal sprouting and 100% defoliated were classified as dead. Garlon 4 provided 74% mortality and Tordon 101 M yielded 67% mortality after 3 years, and were significantly more effective than either Weedone CB or Banvel 520.

Cut-surface Application Study Cutting young sugar maple stems without herbicide application resulted in low percentage mortality and heavy sprouting. Of 48 control tree stumps, 90% sprouted after 2 years. An average of 8 sprouts per stump exceeded 3 feet in height.

All herbicides tested in the cut-surface application trial provided partial control of sprouting during the first year of treatment. However, only three - Tordon RTU, Garlon 3A and Banvel CST - gave acceptable control (90-100%) after three growing seasons (Table 3). Only Tordon RTU gave 100% mortality. However, while Tordon RTU and Garlon 3A provided excellent control of sprouting over all 3 years, it is worth noting that Banvel CST-treated plants were controlled in years one and three but showed extensive sprouting in year two. Conclusions drawn from the second year of the study might indicate that Banvel CST

Table 3. Percentage sugar maple stumps failing to sprout 1, 2 and 3 years following application of herbicide to the cut surface in June 1984.

	Percent "apparent" mortality		
Trade Name	1984	1985	1986
Tordon RTU	100	100	100a[1]
Garlon 3A	100	94	98a
Weedone CB	98	58	73b
Banvel CST	98	54	92a
Weedone 170	77	6	12c
Control	20	10	13c

[1] Means with common letters are not significantly different at $P<0.05$.

was unsuitable for controlling sugar maple through cut-surface application. This emphasizes the importance of long-term herbicide trials.

Foliar Application Study Many herbicide treatments proved ineffective in controlling sugar maple when applied to the foliage (Table 4). Moreover, substantial changes in effectiveness were observed over a 3-year period. One growing season after application, only two herbicides, Tordon 101 M and Garlon 3A, provided topkill in 80% or more of the trees.

After three growing seasons mortality percentages were dramatically different from first year topkill results. Only Tordon 101 M provided 100% mortality after 3 years. Garlon 3A, which was the second most effective herbicide the first year after application with 80% topkill, yielded only 40% mortality in 3 years. Garlon 4, which provided results similar to Garlon 3A the first year (76% topkill), provided 60% mortality 3 years later. It was the second most effective chemical in controlling sugar maple. Foliar misting during the spring may have only limited application in controlling sugar maple, but is selective and can be effective.

As a general observation, herbicide effectiveness decreased with increased stem diameter of the trees. This was especially true for foliar misting and basal stem applications with the exception of Tordon 101M. This chemical was found to be equally effective on trees ranging up to 4 inches DBH with foliar and basal stem application.

Table 4. Percentage topkill (1984 and 1985) and wholeplant mortality (1986) of sugar maple mist blown with 11 herbicides in May/June 1984.

	Topkill[2]		Mortality[2]
Trade Name	**1984**	**1985**	**1986**
Roundup	47	36	36c1
Banvel 720	67	27	38c
Krenite	7	24	29cd
Tordon 10lM	98	100	100a
Garlon 3A	80	42	4oc
Garlon 4	76	40	60b
Weedone 2,4-DP	9	11	16d
Weedone LV-4	44	20	22d
Weedone 170	13	16	18d
Weedar 64	7	7	7de
Control	0	0	0e

[1] Means with common letters are not significantly different at $P<0.05$.

[2] "A tree is classified as topkilled when 100% defoliation had occurred at the time of observation, with no sprouting along the upper stem or in the crown. Trees sprouting at the base were recorded separately and expressed as a percentage of the total plants treated. The term mortality applies only to data collected in the third year after spraying and referred to trees that were 100% defoliated and showed no basal sprouting.

Recommendations

Effective treatments to control sugar maple were found for each of the three methods of application (foliar, basal stem and cut-surface). Tordon 10lM yielded 100% mortality when mist-blown. Tordon RTU and Garlon 3A provided 100% and 98% control, respectively, when applied directly to freshly cut stumps. Garlon 4 and Tordon 101M controlled 74% and 67% of all sugar maple when applied as a dormant season, basal stem treatment. Of the three methods of application evaluated, dormant basal stem application may have the most to offer the practicing forester because of its effectiveness and by avoiding the additional step required in cut-surface application.

Sugar maple understories that are cut without herbicide treatment increase in density because of vigorous sprouting. Ninety percent of all trees cut and left untreated sprouted. Cutting understory sugar maple without herbicide application is not recommended.

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Mention of trade names is solely to identify materials used and does not imply endorsement by the Missouri Department of Conservation. Discussion of pesticides in this paper is not a recommendation of their use and does not imply that uses discussed here are registered.

Results and recommendations presented in this paper are preliminary but represent our best analysis at the present time. Please use this information with care.